REVEALING THE RELATIONSHIP BETWEEN FURNITURE AND PLAY: AN INFORMATIVE TOOL FOR DESIGNERS

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REVEALING THE RELATIONSHIP BETWEEN FURNITURE AND PLAY: AN INFORMATIVE TOOL FOR DESIGNERS

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SUMMARY

Relationships between furniture and children's play are examined in this research paper, with the purpose of connecting features in furniture to specific play activities. The focus of the research is children between the ages of 4 to 8 years old in the context of indoor play at home. An image survey of furniture created for children's use displays a range of attributes and aesthetics designed into children's furniture. A collage study conducted with designers, parents and teachers reveals the perception of furniture's use and anticipated attractiveness to children by analyzing each item's characteristics. Trace observation of how children manipulate their home environment and home interviews with parents provide opportunities for a detailed description of children's play activities linked to specific pieces of furniture. Child interviews conducted for a National Institute on Disability and Rehabilitation Research (NIDRR) sponsored research project for the study of Inclusive Indoor Play provided information on children's preferences with respect to indoor play at home. This research paper discusses how the combined data of these four studies links distinct furniture features to specific play activities. The resulting data proposes an informative tool to be used by designers to create furniture more conducive to children's play.

CHAPTER 1

INTRODUCTION

Background

Young children are not bound by the conventional use of an item. To children a couch is not just for sitting – it also makes a great trampoline or can be pulled apart and rebuilt into a fort. Play promotes creative thinking. Experimental studies performed by Dansky and Silverman (1973, 1975) "revealed that children who were allowed to play with objects were later able to find more creative, nonstandard uses for them," (Johnson, Christie & Yawley, 1999, p. 33). Children are very resourceful in their play. If an object in their environment appears interesting or may contribute to having fun then it will be incorporated into their play.

This is commonly seen in children's use (or misuse) of furniture (Figure 1.1), specifically furniture at home. Parents indicate that children use furniture both passively and purposefully. At times, furniture, a bed for example, is just part of the environment – it is a place to put items or where children rest when tired. Sometimes that same furniture is the object of focus – it is what helps children reach things up high, the place to hide their things or themselves or something fun to jump on and off. Other times it is an alien space ship, symbolizing a thing which only exists in an imaginary world. Children "learn by constructing and reconstructing the world through their play generated learning experiences" (Elkind, 2007, p. 103).

Figure 1.1 Furniture "Misuse" (Topping, 2008)

The diversity of children's play behavior adds complexity to designing furniture. In addition to designing for furniture's intended use and parents' concerns and needs designers must anticipate a variety of unusual ways children might interact with furniture as well. Parents interviewed said, when purchasing furniture for children they consider safety, cost, appearance, durability, longevity and usefulness. These are specific terms designers can use to design furniture. Designing for children's varied play usage is potentially more difficult particularly when furniture is used over long periods of time. As they age, children's interests evolve. In turn, their play things should ideally accommodate various types of play. When designing furniture supportive of children's play, it will be beneficial for designers to better understand how children of different ages interact with furniture when playing.

Significance and Focus of Research

The focus of this research is free play in the homes of 4 to 8 year old children. At four years old many children begin attending school. This change in schedule decreased the amount of time for free play. Older children's (past eight years) play is more social (Elkind 2007, p. 9). Children's play activities are directed by what is acceptable by their peers, said parents in studies conducted for this research. The literature survey revealed several benefits of free play, such as functioning independently, thinking creatively, and learning control. The home is one of the few places children have time for free play (Hofferth & Sandberg, 2000). Studies performed as part of this research show that children play in almost every room of the house, often using furniture in their play activities. To assist designers in creating furniture supportive of free play, this research seeks to discover features which could be incorporated into furniture which that facilitate children's play.

Data collected for this research are distilled into three categories: play types, play activities and furniture features. Examples of play activities using furniture are documented and analyzed revealing what furniture features specifically facilitate play activities and what type of play is taking place. Play activities are categorized into types of play. These types of play include: physical play, cognitive play, independent/social play, guided/self-directed play, pretend play and creative play (Johnson et al., 1999).

This data are finally formatted specifically for designers to use as an informative tool to aid in the process of developing furniture for children. The object of this research is to provide designers with insights into how children use furniture for play and how features of furniture promote specific types of play activities. The manner in which a designer uses the data is not directed by this research.

CHAPTER 2

SURVEY OF LITERATURE

> *"A child is eager to learn and wants to explore his world by using it, by choosing what he wants to do, by touching and manipulating. When the room/environment invites this kind of imaginative participation and suggests but does not limit play, it is successful"* (McGrath & McGrath, 1978, p. 21).

Time for Play

At approximately four years old, children in the US often begin attending Pre-K. At five years old, children start their elementary education. Formal education accounts for an average of 26 hours and 48 minutes of children's weekly schedule according to a study of the changes in American children's time. The portion of children's time spent in structured activities, such as sports and arts increases as children age. This is compounded by the fact that for a given age group children's participation in structured activities has increased over the years. It is expected that time spent on educational and structured activities will continue to increase due to the rise in educational levels of the population. The values parents place on the attainment of various skills also influence how children spend their time (Hofferth & Sandberg, 2000). Structured activities are led by adults. Although children learn and practice many skills they look to adults for direction and approval.

The aforementioned study also discloses the decrease of children's free time by 7.5 hours per week from 56.5 hours in 1981 to 49 hours in 1997. It is believed that this decrease of free time is related to the drop in time children spend at home. Consequently, discretionary time and playtime have also decreased. Parents, educators, and child advocates are concerned that the loss of free time will affect children's development, particularly in the areas of imagination and social skills (Cohen, 3007).

During unstructured free time, children control the play activity and are able to think, wonder, invent and create (Conner, 2007). Psychologist involved in childhood studies confirm free time is necessary for children to learn self-regulation which is defined as "the ability for kids to control their emotions and behavior, resist impulses, and exert self-control and discipline," (Spiegel, 2008).

Figures 2.1, 2.2, and 2.3 from *Changes in American Children's Time, 1981-1997* present the changes in weekly hours by age, focusing on children ages 3 to 12 years old. Discretionary time decreased for all age groups studies. Playtime decreased for 3 to 8 year olds, but increased for 9 to 12 year olds. This increased playtime may be due to increased use of video and computer games (Johnson et al., 1999, p. 33). Play changes as children age. According to Elkind, "play becomes more prominent than it was" for younger children (2007, p. 9). Older children are more focused on game play and playing with friends.

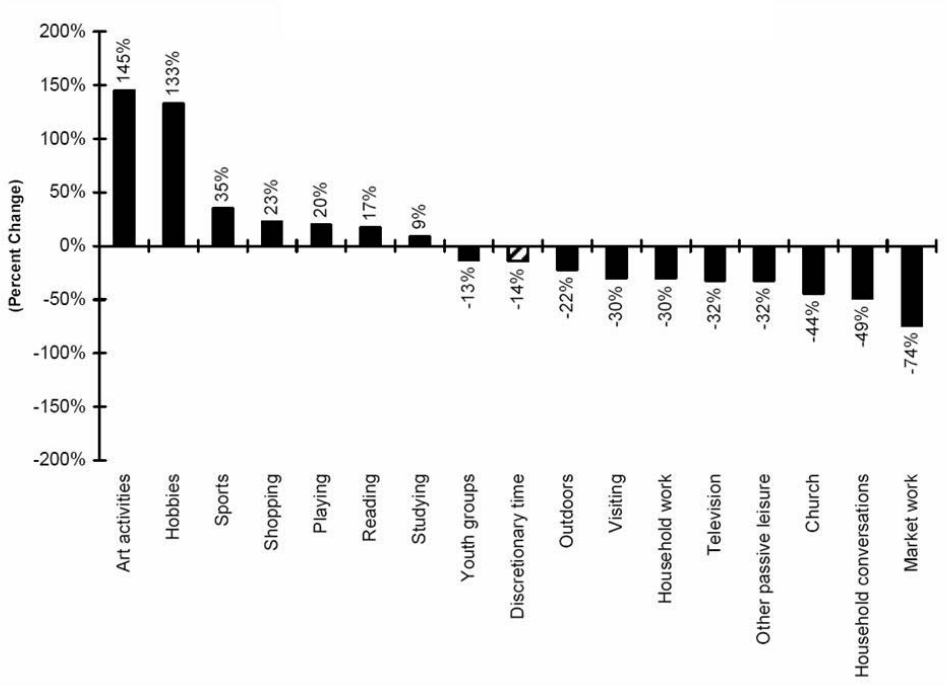

Figure 2.1 Changes in Weekly Hours by Age from 1981 to 1997

(9-12 Year Olds) (Hofferth, 2000)

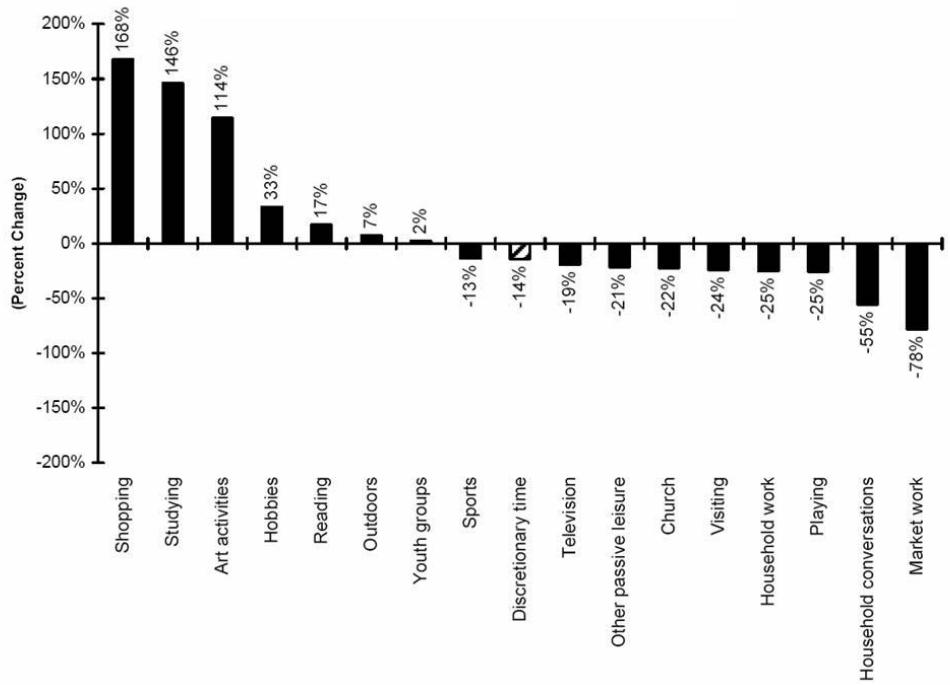

Figure 2.2 Changes in Weekly Hours by Age from 1981 to 1997

(6-8 Year Olds) (Hofferth, 2000)

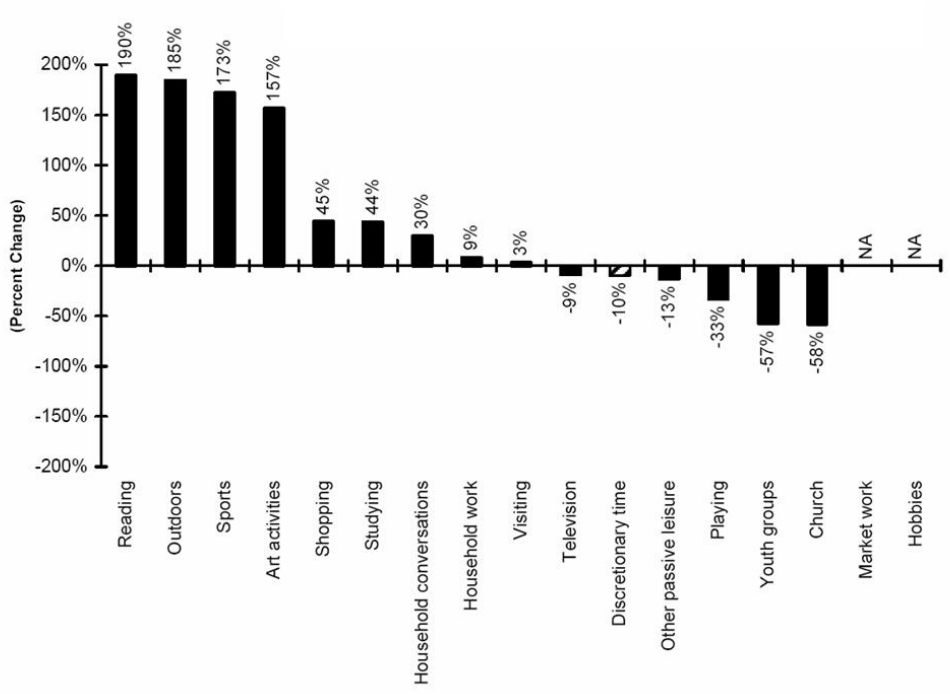

Figure 2.3 Changes in Weekly Hours by Age from 1981 to 1997

(3-5 Year Olds) (Hofferth, 2000)

Free Play

> *It is vitally important to support and encourage self-directed activities by the infant and young child. Even if those activities appear meaningless to us, they can have great purpose and significance for the child. These activities are not random and have a pattern and organization in keeping with the child's level of mental ability. Allowing the child time and freedom to complete these activities to her personal satisfaction nourishes that child's powers of concentration and attention. Left to her own devices and infant or young child can spend a long time on an activity in which she is deeply immersed. We run the risk of impairing these powers if we don't respect and value the young child's self-initiated activity* (Elkind, 2007, pp. 92-93).

Unstructured free play is play in which the activity is directed by children and not determined by adults. Several benefits result from children having free time, including learning control and self-regulation. Free time refers to tome when children can indulge in make-believe play. During make-believe play children try different roles and learn social interaction and empathy. During free time, children also use their imagination in symbolic play, pretending they are in a different place or "invent new ways of using materials and objects," (Singer & Revenson, 1996, p. 56). Through free play,h children's creativity is not limited by the opinions or beliefs of others (adults). Allowing children to have time of their own provides them the opportunity to play with different things and explore their interests.

Play is important for many reasons. Piaget mentions that it is through play that children develop cognitively, socially, and emotionally. Play theorists also explain that development is directly linked to play, that "play reflects, reinforces and results in development" (Johnson et al, 1999, p. 26). Elkind postulates that learning occurs

"through self-initiated exploration and discovery" as play is how children adapt the world to themselves and create new experiences for learning (2007, p. 90).

Scientists who study play have documented that play "is a central part of neurological growth and development – one important way that children build complex, skilled, responsive, socially adept and cognitively flexible brains," (Henig, 2008). Scientists are studying how play affects brain development and growth. Jaak Panksepp and Stephen Siviy located the play drive in the thalamus, which is a primitive region of the brain (Henig, 2008). A study with animals conducted by John Byers suggested play may be linked to growth of the cerebellum, "there is a sensitive period in brain growth, during which time it's important for an animal to get the brain-growth stimulation of play; and that the cerebellum needs the whole-body movements of play to achieve its ultimate configuration," (Henig, 2008). Sergio Pellis, a neuroscientist, has found that play deprivation interferes with the pruning of brain cells, branchings and connections in the prefrontal cortex. "Play is thought to be one of the environmental influences that help pruning," (Henig, 2008).

Play Types

Play theorists, researchers and psychologists categorize play into different types. Names of play types may differ, but how they describe play is quite similar. Play types do not necessarily occur independently of each other, as children may engage in multiple types of play in one activity. Johnson et al. describe an example of three children playing a domestic scene in which one child plays the mother, another plays the father, and the third child plays the baby. This is an example of imaginative play and social play.

The names of different play types used in this research are: physical play, cognitive play, independent/social play, guided/self-directed play, pretend play and creative play. Each play type is briefly defined below.

Physical play

Play focused on the use of the body in which children exercise their gross motor or fine motor skills, also known as functional play, motor play, gross motor and fine motor play. Figure 2.4 shows as child engaged in physical play. It includes “rough and tumble” styles of play. Occasionally this type of play falls under practice play or mastery play as described in the cognitive play section.

Figure 2.4 Physical Play (Topping, 2008)

Cognitive play

Also known as constructive play. In cognitive play, children use convergent thinking – bringing knowledge they have from different areas into their play, which enriches play and aids in learning new patterns and strategies. Game play, books and educational toys are part of cognitive play.

This play is also part of mastery play or practice play. In mastery play children repeat an activity, practicing, until a skill is learned. (Elkind, 2007, pp. 103-110). This includes mastering all play types. After mastering a skill, children begin innovative play - play in which children push the limits of their knowledge and experience to gain further knowledge, because it is exciting to try something new.

A children's desk, Figure 2.5, is where they write poems, draw pictures, prepare practice lessons for their siblings when they play teacher.

Figure 2.5 Cognitive Play (Topping, 2008)

Independent play and Social play

Independent play takes place with a single child. Social play, also known as kinship play includes two or more children (Elkind, 2007, p. 112). When children play with each other they learn control (taking turns), interaction and compromise and making friends (Singer & Revenson, 1996, pp. 55-56).

Guided play and Self-directed play

Guided play includes play with rules such as board game play, physical games, video games and computer games (Figure 2.6). Howard Chudacoff described that certain amount of freedom in play is lost when playing with a licensed toy or character toy since they "come with a prepackaged story and ready-made fantasy life," (Cohen, 2007, para. 22). Self-directed play does not have external rules. Activities are determined by children.

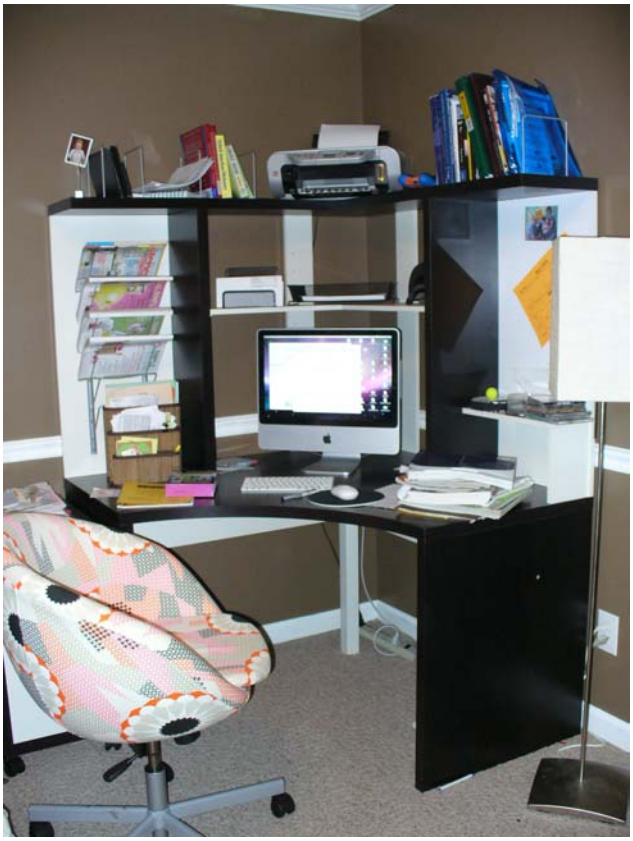

Figure 2.6 Guided Play (Topping, 2008)

Pretend play

Also known as make-believe play or dramatic play. This includes fantasy play, role-play and symbolic play (Singer & Revenson, 1996, pp. 47-50). In this play type children may imagine themselves, others and things to be something other than they really are. Children may also create imaginary situations, experiences and even friends. "Imaginary companions may serve as fantasy surrogates of the child's wild side," (Elkind, 2007, p. 115). Pretend play is also used in therapeutic play (Elkind, 2007, p. 113), in which children may imagine an event that has happened and imagine different outcomes, or try different roles to better understand the situation from different perspectives. Sometimes external items are incorporated and used to facilitate the play activity. Items may include dolls, stuffed animals, action figures, costumes and objects in the environment, such as furniture. Figure 2.7 shows a pretend play scenario in which the child is using a small chair with a pillow to symbolize a toilet and a toilet seat. The bin is the bathroom sink, a ladle is the faucet and a cup full of play cutlery becomes a cup of toothbrushes.

Figure 2.7 Pretend Play (Topping, 2008)

Creative play

Creative play relates to originality (Johnson et al., 1999, pp. 86-87) and divergent thinking. Divergent thinking in creative play involves expression, exploration, and exploring different possibilities. This play is also imaginative and includes the qualities of self-regulation. Creative play includes arts and crafts (Figure 2.8), microworlds, story telling, and music expression. Microworlds are miniature worlds children create with small toys and may have an imaginative theme attached.

Figure 2.8 Creative Play (Topping, 2008)

Benefits of Free Play

Theory clearly suggests that play has both short-term and long-term benefits for the child. *Short-term benefits* are positive effects of play are realized immediately or in relatively close temporal proximity to the play experience. *Long-term* (deferred) *benefits* are realized later, often cumulatively, over days, weeks, months, and sometimes years. A *sleeper effect* occurs when the value of prior experiences is not seen over considerable time periods but then emerges and is attributable to the earlier experiences. Beneficial effects take the form of play *contributing to* development or at least *cementing* it (i.e., play both *results in* and *reinforces* development, as noted previously) (Johnson et al., 1999, p. 26).

Play contributes to learning. "Learning is the product of play-generated experiences limited only by the child's level of intellectual development," (Elkind, 2007, p. 103). Children benefit cognitively, physically and emotionally from playing. Free play has particular benefits in control and creativity.

Control

> *"Children at play need to be in control in order for the activity to be playful, enjoyable, and beneficial. The sense of power, mastery, control, and autonomy accompanying play is too integral to play, and too critical to a child's development and well-being to jeopardize through deliberate intrusions by adults trying to cultivate a particular play style,"* (Johnson et al., 1999, p. 119).

Free play helps build executive function. Executive function is the ability to control one's own behavior function (Speigel, 2008, para. 31). These cognitive skills include self-regulation, working memory and cognitive flexibility. Self-regulation is defined by children's ability to "control their emotions and behavior, resist impulses, and exert self-control and discipline," (Speigel, 2008, para. 11). Working memory is the amount of information retained and accessible during a play activity. Cognitive

flexibility is also important as it relates to the brain's ability to adjust and view things from a different perspective. Children that perform better in school have good executive function (Speigel, 2008, para. 11). This is evidence of the benefits of free play on cognitive development.

It is also important that children be able to control their environment. "Controlling the environment leads to feelings of accomplishment and independence, whereas a lack of control may result in helplessness," (Trancik & Evans, 1995, p. 2). Trancik & Evans are referring to the scale of the environment. In order to adapt to an inappropriately scaled space children might employ a piece of furniture to work with their environment (Figure 2.9). Children that are self-reliant feel better about themselves and behave better (Gibson, 2007, para. 5).

Figure 2.9 Using Furniture to Control the Environment (Topping, 2008)

Creativity

> *"Creativity is as important as literacy and we should treat it with the same status,"* (Robinson, 2006).

Several studies have been performed to determine whether play leads to creativity. Many of the studies investigated creative thinking, thinking in unusual patterns and making novel connection with information. Fisher (1992) surveyed studies from 1974 and determined that the effects of play on divergent thinking, in particular *ideational fluency* consists of the ability to produce flexible and original associations," (Johnson et al., 1999, p. 33). Divergent thinking is synonymous with creative thinking, which is considering all of the different possible outcomes of a situation. Divergent play describes playing (or using) an item in a manner different than its original intent. Johnson et al. (1999) gives an example of children stacking puzzle pieces like blocks. Divergent play has been studied by psychologists to evaluate how it benefits problem solving.

Gardner theorized children are born with specific genetic predispositions, and through interaction with the environment, children will discover which area of intelligence their talents lie. He recommends:

> "Because one cannot prejudge in which areas a child may have latent talent, assuring a general exposure to all kinds of stimulation relevant to each type of intelligence is wiser than providing more limited but intensive exposure only to factors selected to affect a particular intelligence. Purposely attempting to foster a particular style of play in young children could preclude the child's finding the intellectual, expressive, and creative ways of being that are most natural. This is too much to risk, given that spontaneous playfulness in children appears to be so critical for later adjustment and creative expression," (Johnson et al., 1999, p. 120).

Gardner's theory supports the need for free play and establishing environments that expose children to different experiences.

Environment

> *"Well designed physical environments encourage the development of increased personal competency, allowing children to perform at their current level of abilities, while at the same time pushing them to practice more complex skills,"* (Tranik & Evans, 1995, p. 44).

Johnson et al. (1999) discusses different ways children use a space and expresses the importance that children's environments support their activities through the arrangement of the environment and materials. Selection of materials placed in the environment is also important (Connelly, 2000). Materials found in the home environment include clothes, toys, furniture, books, electronic media, and accessories including decorations (curtains, bedding, pictures). Clothes, toys, some books and accessories change as the children age and grow out of them, but furniture remains in the environment over several years. Parents hope furniture will last long as it tends to be more expensive to buy and replace (comments from Parent Interview study). "The home-life experiences of the young child are vitally important in the development of play behaviors. We know that in general, parents and other significant adults in the child's environment exert very important effects on the child's play," (Johnson et al. 1999, p. 117).

Play with Furniture

Four common categories of research about play are: definitional studies, correlational studies, individual-difference studies and ecological studies. Research of how furniture facilitates play is considered an ecological study. Ecological studies examine the effects of a setting or material on play behavior (Johnson et al., 1999, p3). Furniture establishes a room's function, such as a room with a bed is defined as the bedroom; a room with a couch is usually the living room. Parents interviewed

commented that furniture is an item in a home environment that infrequently changes. Furniture's constant presence in the home makes it a significant material that is part of children's environment, contributing to the identity of that environment. "Familiarity with the environment supports a sense of attachment and ownership within children, this results in a sense of security which gives children the confidence needed to challenge themselves," (Tranik & Evans, 1995, p. 51). With most rooms containing furniture, children have several items with which to play.

Affordances for Play – Furniture Features

Affordances describe the qualities of an item or environment that allow a person to use the item or environment in a specific manner. Likewise, affordances in furniture allow children to use furniture in a specific manner. Different features afford different play activities. Much has yet to be understood about how furniture facilitates children's play. Literature examines the topic of play, forms of play, benefits of play, and some environmental factors related to play, but there exists little data related to affordances. Further investigation is required to better understand how play activities are supported by furniture features.

CHAPTER 3

RESEARCH STUDIES AND METHODOLOGY

Research studies were developed to achieve three objectives. First, identify furniture made for children and determine its primary function. Second, explore how designers and parents perceived children will use furniture. Lastly, understand how children actually used furniture when playing. Three studies were conducted to investigate furniture's relationship with play from the perspective of two adult stakeholders: parents and designers. This paper also reviewed data gathered from a NIDRR – funded research activity on indoor play habits of children. The NIDRR data represent the children's point of view with respect to indoor play. Data collected from the aforementioned studies could be combined to form an informative tool for designers, which will be discussed later in this paper. Each study resulted in a collection of qualitative insights, not statistical data.

Study 1: Furniture Typology – Image Survey and Sorting

Purpose

While the focus of this research is furniture as it relates to play, the primary use of a piece of furniture remains important and must also be understood. The purpose of this study was to understand if common features exist within various groups of children's furniture (e.g., furniture which supports eating), what are those common features, and what actions do they enable. The hypothesis being that specific features likely form the core functional attributes of that furniture group (e.g., furniture which supports eating include a sitting surface and a surface upon which food is placed).

Methodology

Images of children's furniture were surveyed and gathered from various sources, including magazines, internet, catalogs, and retail stores. Based on observable features, the investigator sorted these images into categories of activities enabled by these features, creating a typological map (Figure 3.1). Ten categories, listed in the next section, emerged from this exercise. In instances where an item of furniture enabled multiple activities, images of that furniture piece were placed in each relevant category. Common features which enabled an activity were then identified for each group.

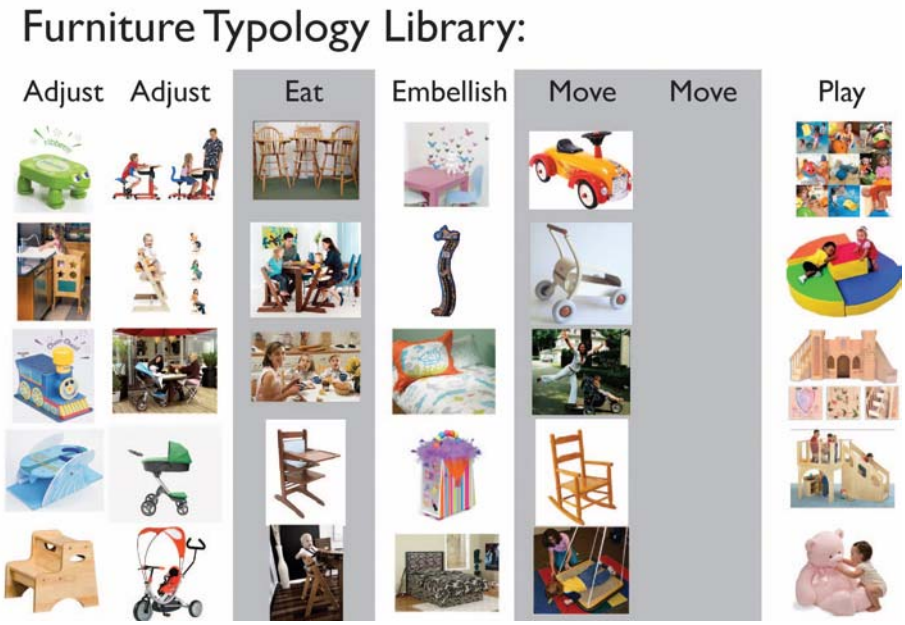

Figure 3.1 Furniture Typology - Sample Section (Topping, 2008)

Insights

Categories Resulting from the Typological Study

Recline Furniture which supports the entire length of the body in a supine position. The common feature of *Recline* furniture is a large, soft horizontal surface. This feature enables relaxing, resting, and sleeping in a supine position.

Sit: Furniture which has a horizontal, not necessarily planar, surface to support children when seated. The shape and density of the seat often vary. Another feature of *Sit* furniture is reduced scale compared to similarly purposed furniture intended for adults. The reduced scale typically allows children to seat themselves unassisted.

Work: Furniture which enables children's work (e.g., school work, coloring books, etc.). This category of furniture includes three key features: an area for children to sit, a horizontal surface at a higher elevation such as a table or desk, and reduced scale compared adult furniture. These features enable children to sit comfortably and provide a work surface upon which they can place the focus of their work. The reduced scale places the work surface at the appropriate height and, as described for *Sit* furniture, typically allows the children seat themselves unassisted.

Eat: Furniture which supports eating. Furniture in this category are similar to those in the *Work* category. They both include a seating surface and a higher horizontal surface. This study found that there is scant *Eat* furniture designed expressly for 4 to 8 year olds. Photographs from the image survey depicted children of this age group using adult *Eat* furniture. Two key differences between *Work* and *Eat* furniture categories are aesthetics and the intended end users. *Eat* furniture is designed to be used by the entire family. Accordingly, the aesthetics and scale do not specifically cater to children. However, *Work* furniture is targeted specifically to children. Therefore its aesthetics and scale are appropriate for children.

Store: Furniture which is intended to support or contain items, not people. To enable storing, prominent features include either a flat surface upon which items can be placed or have voluminous compartments in which items can be deposited.

Embellish: Furniture which supports expression. The most common feature is an open surface upon which children can write, mark, paint, or apply stickers and patches. Several items of furniture were encountered which are designed to support those activities. They do so by including the artistic supplies (markers, stickers, etc.) and/or are constructed of materials that both accept those embellishments (i.e., not fully resistant to marking) but can also be easily cleaned to remove the embellishments.

Move: Furniture which enables movement. The body moves when using the furniture. Curved rails (as in rocking chairs) and wheels (or casters) were the most commonly encountered features. Other features include bouncy or fluid surface like a waterbed which moves the body. These features enable children to bounce, spin, rock, scoot or roll.

Adjust: Furniture which enables one or more of the following three identified adjustment types. First, furniture which adjusts the position of children, allowing them to function independently in an environment (e.g., a step stool allows children to reach a faucet and wash hands unassisted). Second, is furniture that changes form from one furniture type to another, such as a crib that can be rearranged into a desk. This enables a variety of actions with a single piece of furniture, occasionally extending the life of the furniture. Third, furniture which morphs to a different scale version of the same kind of furniture, for example a toddler bed morphs into a twin bed.

Secure: Furniture which seeks to secure children. Common features include belts or walls. These features help protect children by keeping them from moving out of an area or out of the furniture.

Play: Furniture which is explicitly designed with the intended purpose of play (Figure 3.2) or furniture which served a dual focus, for example both as an area for play and recline.

Figure 3.2 Pay Furniture: Navicella (babygadget, 2007)

The *Play* furniture category has few universally common features. Of the categories researched in this paper, *Play* furniture has the most variety in form, texture, color, and decoration. Apart from scale and the tendency to be more colorful, no features were uniformly present. *Play* furniture is often adjustable, allowing children to disassemble, reassemble, rearrange or stack furniture components. Enclosures large enough to accommodate one or more children are also common. Some *Play* category furniture are mini-forts, tents or playground equipment adapted for indoor use.

There was little uniformity in shape as both simple geometric shapes and abstract shapes were encountered. However, shape often played a prominent role in *their* design. In other furniture types, shape often appeared to be derived from desired primary function. In *Play* furniture, however, shape appeared to be an important design consideration in itself, perhaps equal in importance to function.

Summary of Insights

Functions: Each of the identified furniture categories have specific features which enable specific activities. By understanding the intended function, designers incorporate and refine those features. This study has produced a baseline of features and the functions which they support. However, designers who seek to facilitate play within their children furniture designs should also incorporate features which go beyond enabling the primary function.

Individual/Social: Some furniture is intended for use by one child at a time, others by several children at once. Across all topology categories, scale was seen as a large factor in determining if a piece of furniture will be used by one or more children. Designers should consider the potential benefits of scale when seeking to encourage social play.

Form: In children's furniture form does not always follow function. Unlike adult furniture, children's furniture forms include superfluous elements such as pronounced geometric shapes and large-radius rounded corners. Given that most furniture has a primary function (e.g., eat, work, etc.) designers who strictly adhere to "form follows function" may produce children's furniture designs which minimally facilitate play. The various forms in the marketplace suggest the children's furniture market is more accepting of novel form designs than that of the adult furniture market. While it is still necessary to incorporate the core features which support the primary function, designers of children's furniture have more latitude with respect to innovative forms. Therefore, designers should experiment beyond the core function and explore forms which may potentially accommodate several functions when designing for play.

Materials: A variety of materials are found in children's furniture. Material selection is largely predicated on use. In *Recline* furniture, soft surfaces are common. High strength,

durable materials, such as wood, plastic and metal, are frequently seen in larger pieces where heavy loads are anticipated. Plastic is common in small to medium sized pieces that need to be light weight (so children can move it). Plastic is also used when furniture may be exposed impacts, spills or prolonged moisture. Functions which require softer materials often use foam or padding upholstered in stain resistant fabrics. *Embellish* furniture often used specialized materials which allow repeated markings and cleaning.

In the case of materials, function largely drives the material choice. Designers are encouraged to consider both the primary function and potential secondary functions when selecting materials. For example, thin wood slats on a bed will accommodate the primary function of sleeping; however may not be adequate to support another common function: jumping.

Surface decoration: As compared to furniture designed for adults, children's furniture has more color and embellishments (Figure 3.3). This study found that children's furniture is often decorated according to specific themes, such as baseball or princess with characters from popular culture. Colors range from bright primary colors to softer pastels. Some furniture were more neutral in color: white or natural wood. However, these structures frequently had color accents in the replaceable parts, such as the knobs, bedding or upholstery.

Figure 3.3 Embellish: Flutterflies Decoration Kit (supercoolbaby, 2007)

Soft/Hard: Soft furniture is more flexible and comes in a variety shapes and sizes. Suspended material, found in tents or trampolines are soft but firm. Soft furniture often conveys comfort and seems safer. Hard furniture is rigid and generally angular. It conveys strength, rigidity and permanence. The concept of soft and hard can determine how children interact with furniture. Children are less likely to run and dive on to a hard bench than a soft couch.

Study 2: Furniture Language – Exploring Parent and Designer Perceptions

> *"Conceptual models are part of an important concept in design: mental models, the models people have of themselves, others, the environment, and the things with which they interact,"* (Norman, 1988, p. 17).

Purpose

The purpose of this study is to further refine the previous typology study by identifying the visible elements or features within a piece of furniture that affect people's perceptions. Specifically, what about the piece of furniture causes people to perceive it as more play-like versus more furniture-like?

From its appearance, people infer or envision various types of interaction and possible ways to utilize furniture. "Mental models, also referred to as cognitive models or conceptual models, are the pictures we form in our heads of how a product or system operates," (Shankwiler, 2006, p.24). This study seeks to understand the visual cues upon which these models are based. This study also explored how those perceptions differ between parents and designers.

Methodology

Subjects recruited for this study include nine designers and six parents. Only one of the designers was also a parent. Each subject was given a piece of paper with a continuum, the endpoints being "toy" and "furniture" (Figure 3.4). They were then given 36 images of products (Figure 3.5) marketed in one of the three following categories: toys, children's furniture, or furniture not specifically designed for children. These were the same images used in the furniture typology study. Subjects were then asked to place the images along the continuum according to how they perceived each piece of furniture: toy, furniture or somewhere in between.

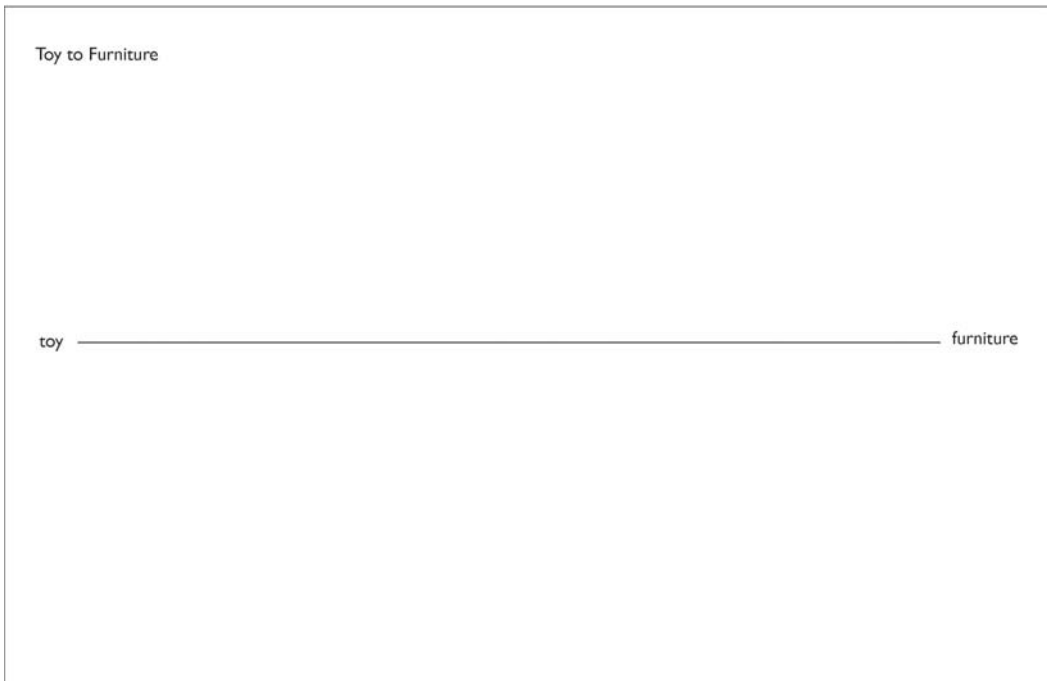

Figure 3.4 Furniture Language Continuum (Topping, 2008)

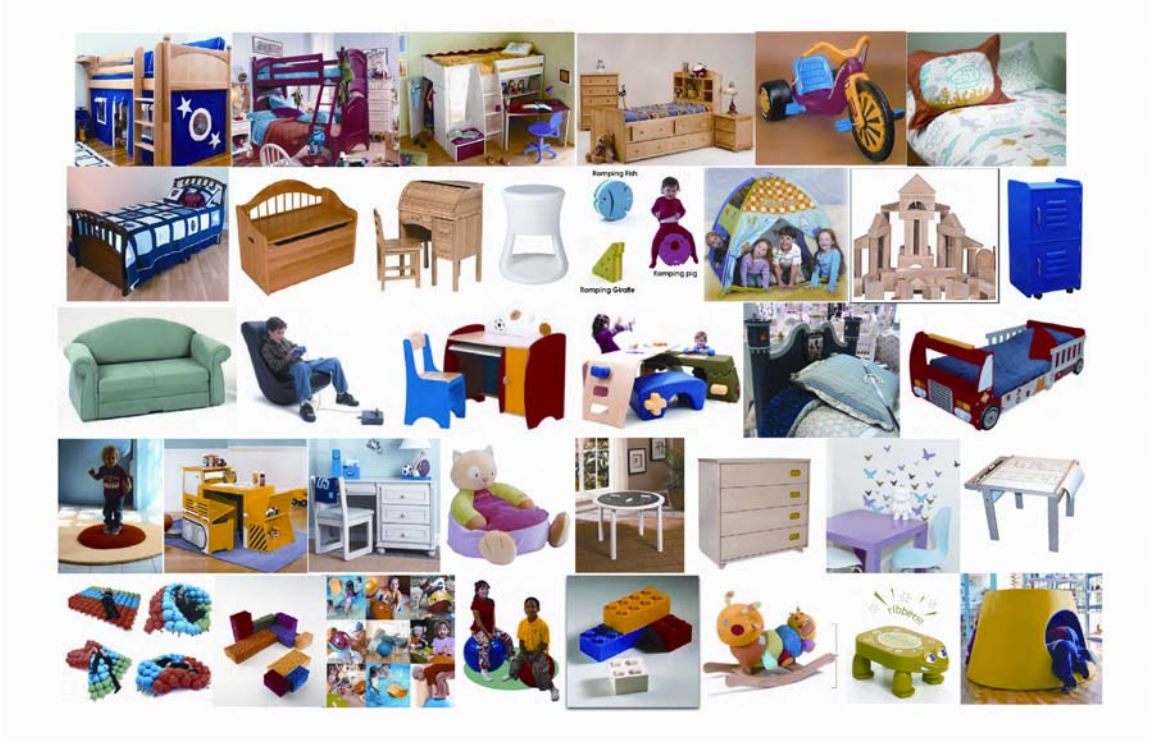

Figure 3.5 Furniture Language Images (Topping, 2008)

Figure 3.6 Furniture Language Completed Collage (Topping, 2008)

Upon completion of this task, the subjects were asked to explain how they decided where to place the images (Figure 3.6). What about each image shaped their perceptions? How might the items in each image be used by children between 4 and 8 years old?

Insights

More discussion was generated by items lying in the middle of the continuum, as opposed to items at the endpoints. This is because most interview subjects expressed that they have a reasonably clear understanding of furniture and toys as distinct items. But it became clear from the ensuing discussions that these constructs were not fully developed and many interview subjects had difficulty articulating the rationale for placing certain pieces between the endpoints.

These discussions often focused on rating the functionality of the items. Most of the subjects stated that items at the furniture endpoint had the most functionality. Item's

functionality diminished from the furniture endpoint to the toy endpoint. Items at the toy endpoint were often said to have little to no function. With few exceptions, interview subjects expressed that the term "functionality" connoted a single, clearly defined purpose. This suggests many adults have a somewhat narrow perspective on the potential functions of furniture.

Summary of Insights

Scale: Toys were perceived to be small items that can be moved or manipulated by hand. Furniture was described as large and bulky. Items in the middle of the continuum were described as light enough to be moved, but large enough to support the body. While scale was an important factor in the formation of adults' mental models, it is not a feature that defines playability. Scale does appear to affect the perception of playability.

Form: Toys were often abstract forms or simple geometric shapes. Furniture was described as angular and blocky. Items in the middle of the continuum were a mixture of both form values. It was observed that when the form of an item did not clearly result from its function, adults tended to describe the form as more toy-like.

Appearance: Toys were described as colorful, small, manipulatable and attractive. Furniture's appearance was considered dull, large, immovable and fixed. Subjects indicated that items they placed in the middle of the continuum look like toys but tend to function more like furniture. It can be thus inferred that colorful designs with manipulatable features will communicate play-like attributes.

Functionality: Most subjects used functionality to describe an object (mostly furniture) that had an obvious singular purpose. Toys were described as having no particular function other than play or entertainment. Items in the middle of the continuum were

rated by obvious functionality. Items of less obvious function were placed at the toy endpoint, whereas when the functional use became more obvious, the items were placed closer to the furniture endpoint.

Parents indicated that limited space at home often precluded purchasing furniture which did not properly address a needed primary function (i.e., sleeping or storage). Therefore designers must include in their design visual cues which communicate that the furniture does in fact fulfill the primary function needed by parents. This is particularly important for designers who are experimenting with new forms, ancillary functions or other features which facilitate play. Without careful consideration, the features which support the primary function may be obscured, and thus, parents may not select the piece of furniture.

Parent and Designers

Parents were able to quickly arrange the images along the continuum. As they discussed the images, they drew upon their knowledge as a parent, describing how their children would likely use the item. Parents often indicated that there were clear divisions or increments between toys and furniture. They created their own categorization scheme, frequently with four common categories: toys, toys that have some furniture function, furniture that resemble toys, and furniture. One interview subject's comment reflected the sentiments offered by many others, "This bed is made to look like a toy, but it is a piece of furniture. A child would be excited about it for five minutes and then never play with it again," (Figure 3.7). Parents were more focused on how an item was *actually* used (in their experience) than on the potential for how the item *might* be used. As parents talked more about items in the pictures, they would recall stories of how their children use furniture in unusual ways, such as tying elastic bands to the knobs of dressers to create a slingshot.

Figure 3.7 Firetruck Toddler Bed (KidKraft, 2008)

When placing items on the continuum, designers generally took more time examining the images than did the parent subjects. The focus of designers was also skewed toward the singularity of functionality but not to the extent of parents. Functionality again served as a predominant input to placing items on the continuum. Unlike parents, designers tended not to create a few rigid categories in to which they allocated the furniture items. Instead, they tended to have several nebulous groupings between the two end points. These included toys that are small, toys that are large and can be sat upon, items that look like toys, items which have both toy and furniture functions, items that are more like furniture but have some toy functions, items that are furniture but colored to look like a toy, and so on. As designers described their continuum, they tended to discuss the *possibilities* of use, "Children could climb on top or under this desk...they could use it for drawing, pull the desk apart…they could even push the items on the side of the desk in and out and play with those" (Figure 3.8).

Figure 3.8 P'kolino Interlocking Desk (P'kolino, 2008)

Generally, designers and parents had similar thoughts on how items in the collage would be used. The collages created by the parents and those of the designers had similar image placement

Study 3: Trace Observation and In-home Interviews

Purpose

The primary purpose of this study was to understand how children *actually* use furniture for play and which features appear to facilitate play-like interactions. This was conducted by observing the furniture and trace evidence in the children's home. The types of the furniture found in children's environment was noted.

The secondary purpose of this study was to explore parents' preferences for children's furniture and how they felt furniture "should" be used by their children. Discussions revealed that these preferences impact the use of furniture by children.

During the interviews, parents discussed how they came into possession of the furniture. Most furniture was obtained in one of three ways: parents either bought the furniture themselves, parents indicated specifically what furniture they wanted and it

was purchased for them as a gift, or parents selected from available “hand me downs” from friends or family. In most, but not all cases, parents had a direct hand in specifying which furniture items would be in their home. If a parent's preferences are not adequately satisfied at the time of acquisition, children may never be exposed to a furniture design. Parents indicated they influence children's use of furniture once it is in the home. Strong preferences by the parent, especially when play-like interactions differ from the furniture's primary function, may result in instructing children to not use furniture in a specific way.

Methodology

To understand how children used their furniture, ten parents (Table 3.1) were visited in their homes. Each visit consisted of an interview with the parent during a tour of the home. Data were gathered in two ways. First, the furniture was inspected for traces of children’s interaction. For example, a doll wrapped in blankets and placed in a dresser drawer in a way which resembled a baby in a crib, suggested the dresser was used in pretend play. Second, data were gathered by asking parents to describe their observations of how children used each piece of furniture and the parent’s preferences for the use of that furniture. If the parent also set limits to the use of a piece of furniture (e.g., no jumping on the bed), this was also recorded.

Table 3.1 Furniture Language - Subjects and Children (Topping, 2008)

Total (Parent) Subjects:	10
Children 4 yrs old:	5
Children 5 yrs old:	2
Children 6 yrs old:	4
Children 7 yrs old:	0
Children 8 yrs old:	1
Female (Children):	9
Males (Children):	3
Total Children:	12

Insights

Children's Play with Furniture

Parents described how their children play at home and how they use furniture to facilitate play.

Couch: Children play often on or with the couch. Parents described children using couches in various forms of play: physical play (jumping on the couch, flipping over the couch, climbing on the arms, sliding down cushions, building obstacle courses with the cushions social), social play (hiding under cushions), and pretend play (building forts with the cushions).

Coffee table: Few parents reported that their children incorporate the coffee table in their play. In these cases, the primary forms of play were physical play (jumping from the couch to the coffee table), social play (playing board games on the table top), and cognitive and pretend (using the table top as an area to play with their small toys, action figures and cars).

Table and chairs: There were two cases in which tables and chairs were used in pretend play. One parent's children used the breakfast table and chairs to build forts. Another's children used the chairs as a pretend train, lining up the chairs one behind another.

Child table and chairs: Small child table and chairs were used in pretend play, such as tea parties. Parents indicated child table and chairs are among the most frequently used pieces of furniture (Figure 3.9).

Figure 3.9 Small Table and Chairs (Topping, 2008)

Wardrobes and entertainment centers: If the furniture piece is large enough, children will play inside hiding themselves (social play). For both large and small pieces, children will use the interior space as a small world or environment in pretend play with their smaller toys (cognitive and pretend play).

Shelves: Interior spaces of a shelf are often used by children as a small world or environment in pretend play with their smaller toys. Some children also climb shelves (physical play).

Dressers: The interior part of drawers are often utilized in pretend play. These are used to create a small world or environment in which children play with their smaller toys. They serve as cribs or beds for dolls and stuffed animals. Some children climb the drawers (physical play). Occasionally, children will decorate dressers in their rooms (creative play).

Bins and toy chest: If the toy chest is adequately large, some children will climb inside to hide (social play). Children climb on toy chests with tops (physical play). Smaller storage bins can be worn on children's heads (pretend play and social play) or turned over on the floor to and used as a step stool (physical play). Children will also climb on larger bins (physical play).

Beds: Beds are commonly used in physical play. Most children jump on beds or perform gymnastics on beds. Bunk beds are like jungle gyms, children climb the sides of the bed and up and down the ladder. Beds are also used in cognitive and pretend play, for example the surface of the bed or the space under a trundle bed used as a play environment.

Play furniture: Some children have play furniture, such as play kitchens, vanities and work shops. These toys are most often used in pretend play.

Small environment: Parents indicated children will play in almost any small spaces they find. Areas made behind furniture, under furniture and, in some cases, inside furniture are used as play areas (Figure 3.10 and 3.11). These provided private places (self-directed play), forts (pretend play and social play).

Figure 3.10 Small Environment in Wardrobe: 1 (Topping, 2008)

Figure 3.11 Small Environment in Wardrobe: 2 (Topping, 2008)

Parent Opinions of Furniture

Likes: Furniture that children could manage by themselves was preferred by parents, e.g. every family had a version of a child size table and chairs that children could sit at and draw or play independently. Another benefit of the child table was that it saved the family table from being damaged by glue or paint. Parents liked storage bins, because they are easy for the children to use, so children can clean up after themselves.

Dislikes: Parents expressed a dislike for maintaining children's spaces, particularly the difficult or tedious tasks. They find making the bunk beds, especially the top bunk, difficult. Parents dislike cleaning cluttered areas, putting toys in toy boxes or putting books back on the shelves. To minimize time spent on those tasks, several parents indicated they established easy to follow storage systems that children can learn. This was done with the hope of having the children to maintain their own spaces. Constantly

reassembling the couch cushions was also cited as tiring (Figure 3.12). Parents also expressed a strong dislike for children's furniture that did not fit the décor of the home.

Figure 3.12 Couch "Misuse" (Topping, 2008)

Rules: Concerns for children's safety and protecting furniture from damage was central to most rules. Parents did not want children to do anything the parents perceive as unsafe. They also did not want children to permanently damage furniture. A few frustrated parents indicated cushions were being ruined and needing reupholstering. Rules were also established to minimize the spread of clutter. Rules included no jumping on the bed or that toys can not leave a specific room.

Storage: Every parent expressed a desire for more storage. They wanted storage items children would use by themselves. Many chose bins, shelves and chests. Most parents intended for items to be stored in an organized fashion, but had become satisfied with items simply being stored. A couple of parents mentioned when items were stored in

such a way that they could not be seen (inside cabinets or closets), these items were often forgotten and not played with. Several toy chests always remained open or had the top removed. When items were stored in a visible way, on a shelf or in an open bin, they were played with more often. One parent found a small coat rack (Figure 3.13) that provided a novel and visible way to store dress-up clothes in a manner that children could see and manage the clothes themselves.

Figure 3.13 Coat Rack (Topping, 2008)

Durability: Parents look for durability when they are considering buying new furniture. Durability should be considered in the structure and materials of construction. Several parents mentioned they would allow their children to play with the furniture in the manner of their choosing if the furniture was more durable. Thus furniture's durability impacts how children are allowed to play with a piece of furniture.

Cost: Furniture cost was a common concern for all parents. Many acquired free or "handed down" furniture. Instances in which parents indicated they spent a considerable amount of money on furniture, they then expected it to be of very high quality and to last forever.

Longevity: Parents were not consistent in their opinions of longevity. Some prefer furniture that will last forever and can be "handed down" through several generations. Others expect furniture to last until children reach adulthood and leave home. Excluding family heirlooms, parents who own "hand-me-down" furniture have low expectations for its lifespan and simply hope to get as much use as possible out of the furniture.

Safety: Safety is a concern among parents with younger (4 to 5 year olds) or with unruly children. Parents expressed concerns about the safety of specific pieces of furniture. The items mentioned were typically acquired before children were born. These items were usually adult furniture and were generally found in common rooms.

Appearance: Parents placed a high value on appearance, even with free furniture. Parents do not like items that look like children's furniture or toys to interfere with the decor of the shared spaces (i.e., the living room or family room).

Accommodations: To enable children to function independently, parents provide children with furniture that helps them function in an environment which may not be well suited for children. Many parents have stools in the bathroom and next to beds. The lower shelves are for the children's books and toys. Likewise the upper shelves are used to display rarely used objects or to keep items away from children. Most children had a small table with chairs, which was light enough for children to move themselves.

Independence: Parents interviewed want their children to be independent. They want children to maintain their own bedroom, function in the bathroom, and entertain themselves.

Study 4: Child Interview - Drawing and Collage

Purpose

Child interviews conducted as part of a NIDRR research of Inclusive Indoor Play were reviewed to represent children's perspectives of playing indoors. Data from the Inclusive Indoor Play study were reviewed to better understand the experience and play behaviors of children.

Methodology

Children were interviewed as they drew pictures. They were asked to describe how they play indoors under three scenarios: when they have a lot of energy, when they need to be quiet, and when they want to pretend. They were also asked to create their own idealistic indoor play place. With each question the children were also asked to draw *how* they played (Figure 3.14). Drawing is in this manner is a tool used to help children communicate their thoughts when they cannot express them fully in words.

Children were subsequently shown 28 images of playthings that might be found indoors, such as a small slide or computer. Children were asked to make a collage by choosing their five favorite plaything images, five interesting plaything images and five images of playthings they would not like to use (Figure 3.15).

Figure 3.14 Child Drawing of Playing Indoors (Topping, 2008)

Figure 3.15 Child Collage of Preferred Playthings (Topping, 2008)

Insights

Children described the activities they prefer when playing inside. This primarily included playing at home, but additional play may have taken place at school, homes of family and friends, indoor play places and gymnastics school. Some children described attributes of play they like and the attributes of furniture they like.

Drawings of Play Activity by Type of Play

Physical play: Activities constitute the type of play children talked about most. Activities mentioned during the interviews included: jumping, climbing, sliding (down a slide or across a hardwood floor in socks), throwing (balls), exercising (push-ups), running, swimming, dancing, and swinging. For some athletic games, children indicated they prefer playing at the home include: baseball, hide-and-seek, red-light-green-light, duck-duck-goose, musical chairs, tag, and gymnastic maneuvers. Devices a few children use in the house for physical play are sit-down scooters, trampoline, stairs, and bikes.

Quiet play: Activities children talked about included: playing board games, reading books, watching movies or television, drawing pictures, and playing video games.

Pretend play: Activities children engaged in at home include: playing dress-up and role-playing as a teacher, parent, superhero, soldier or babysitter. Some children pretend they can fly or they are an animal or monster. Other children like to imagine they are in a different place doing something such as fishing at a pond.

Playthings: Children talked about balls, dolls, toy cars, stuffed animals and play kitchens with play food and dishes.

Fantasy Play Place: One exercise of this study asked children to create their ideal indoor play place. In this fantasy, children invented tall buildings to jump from, jet skis to ride, talking robots, huge play gyms, swimming pools to jump in, arranged tables for board games, and created tree houses and retail shops with exclusive membership to friends and occasionally siblings.

Collage

In the collage portion of the study, the children's favorite objects were the bounce house, ball pit, play gym and soft slide. Children described enjoying jumping in the bounce house and ball pit. They liked how the balls felt and that they could swim in the balls and then throw the balls around. Children talked a lot about climbing and sliding which may be why they chose the play gym and soft slide. They also indicated they liked the soft slide because they could not get hurt if they fell.

Many children said they did not want to play with small animal toys, a gear type of toy, puzzles, drums and basketball. Reasons children stated for not liking these things were that the small animal toys are easily lost and some children will not share. Children thought puzzles and gears did not offer the appropriate challenge – too difficult or too easy. Some children felt drums were too loud. Basketball was disliked by several children because they had been hurt when playing.

Children's Comments

Children talked a lot about other people, specifically family members and friends. Several of the children indicated they play with their parents, siblings or friends. Younger children spoke more frequently of playing with parents and older siblings. Older children talked more about playing with friends than with parents.

Furniture and Attributes of Interest to Children

Furniture children mentioned included tables, chairs, bean bags and beds. Children enjoy experiencing movement and action. Moving fast, jumping, sliding and swinging, climbing are things children stated they do frequently. Attributes children talked about were colors, light, sounds, soft things to jump into, and being in high places.

CHAPTER 4

FINDINGS

Shared Insights between Studies

Every activity, in which furniture is used, can be analyzed to determine what furniture features support that activity. This theory can be employed to play activities and furniture. A method of collecting data was established to identify features in furniture that facilitate play activities in four studies. First, a survey of children's furniture images was conducted by the investigator to identifying ten primary categories of activity specific furniture. Each category was analyzed as a whole, first for common features, then to identify any novel features when no common features were present. The second study utilized images from the first study with the intention of identifying features supportive of unique furniture usage, different from the intended primary function (play). Parents and designers organized 36 images in the context of toys and furniture. This process forced the subjects to visually compare each image to the two terms, encouraging them to pull from their mental models of what makes the image toy-like or furniture-like in appearance and function. Parents and designers perceptions of furniture use were to be confirmed or refuted by the third study. Children's actual play events using furniture were relayed to the investigator in the third study. Traces of children's play activities were observed while parents described how the children used furniture in their play activities. The descriptions of play activities with furniture also revealed furniture features supportive of the play. Several activities confirmed the perceptions of the subjects from study two, but a few perceptions were not supported – primarily the thought that conventional adult furniture would not be interesting to children or be used in an unusual manner. The third study showed this to be false, that children will play with nearly any furniture if allowed by the parent. Even though

children understand the primary use of furniture, they are not restricted by the construct that furniture has a single use. This information led to further analysis of conventional furniture, to identify additional furniture features that made everyday furniture playable. This was further supported by the fourth study, borrowed from a NIDRR research project of indoor play, which revealed play activities children prefer related to play type. Children's preferences of playthings were also analyzed to understand their dominant features. This method of research involved a series of studies that built upon information gathered from an earlier study while also validating information gathered in the following studies. Creating a series of studies that compliment each other can provide a means for evaluating data while producing richer results. These four studies produced a collection of furniture features and play activities to be compiled into a list of features that designers could incorporate into designs of furniture for children. Discussion of features will be presented in Chapter 5.

Furniture Typology and Furniture Language

Both Furniture Typology and Furniture Language studies use visual cues to interpret how children will use furniture. Several of the furniture features identified in the Furniture Typology study were confirmed by the Furniture Language study.

The context of toy and furniture prompted the parent and designer subjects in the Furniture Language study to think of the objects in different manner, and yielded a different variation of furniture features that supported play activities as well as the primary function identified in the Furniture Typology study. These two studies confirmed that a single piece of furniture can be perceived as having multiple functions, including play functions.

Furniture Language and Trace Observation In-home Interviews

Usual and unusual uses of furniture were discussed by parents in the Trace Observation Interview and by parents and designers in the Furniture Language study. Trace Observation subjects relayed data to the interviewer of how their children play with furniture at home. Occasionally the results between the two studies did not match. Subjects of the Furniture Language study expressed a disinterest in the furniture items, saying these items were too boring and likely to be used only for their primary intended purpose, but the Trace Observation subjects revealed that children frequently use standard furniture in their play activities. Children do not seem to view these conventional furniture pieces as boring. Interestingly several of the parents in the Trace Observation study wouldn't be bothered by their children using furniture in the home for heavy play, except that they felt the furniture would not be durable enough to handle the stress of play and furniture is too expensive to replace. Parents are also concerned with their children's safety, but safety did not drive the conversations about how children will use furniture.

Furniture in the homes of the Trace Observation study was generally standard in type. Some children had tents, several had play kitchens, but not many had large abstract furniture for the purpose of play as seen in the Furniture Language study. During the Furniture Language study, parent subjects divulged, that although the furniture for play was interesting to them they would be unable to sacrifice the space at home to have a piece of furniture that had little purpose other than entertaining children.

Features for toy-like items from the Furniture Language study included attributes like: colorful, soft, round, smaller scale than normal furniture, abstract, etc. Interestingly, parent from the Trace Observation study consider furniture with these features great for children, but they do not want to see this type of furniture in the common rooms. Parents were very attuned with the décor of the home and found children's furniture to be an eyesore. They said they were constantly moving the

children's furniture around to free up space or make the space appear more stylish and not childish.

Inclusion of the Child Interviews

Children primarily talked about their play activities in the Child Interview. When they spoke of the different ways they prefer to play they rarely mentioned furniture items except during quiet play time. During quiet time children would talk about the bean bag chair they sat in to watch movies or their bed that they lie on and play with stuffed animals and read.

When children did the collage portion of the interview they would describe features they liked such as: bouncy surfaces, jumping really high and swimming in balls or water. Items with a sensory focus such as slowly moving lights, weightlessness, or sensations of something brushing their skin were highly desirable by children. It is difficult to know how important features such as color or smell were to children.

Children did gravitate to physical activity in their conversation of free play. They also confirmed the desire for smaller spaces that could be within a larger space including forts, tents, a tree house, and storage rooms (for their toys and jet skis).

Several children described activities they do not like (including some contact sports) and materials they avoid (wooden playgrounds) because they have been hurt during these activities or with these materials. Children also had a preference for play items that were plastic with rounded corners, soft foam or bouncy, stating they would not get hurt playing on these items.

Furniture Combo

As well as several features identified in Chapter 3 the studies provided interesting results. When compiled interesting opportunities arise for designers.

In summation, parents liked the idea of allowing their children to play with furniture, but they are concerned that the furniture will be broken or ruined and furniture is too expensive to replace. Parents often provide their children with a small piece of furniture that they are allowed to abuse or play with in any manner, but this piece of furniture is generally unattractive, does not fit well in the common rooms because of the extra space it occupies and it doesn't match the other furniture.

Although children may be attracted colorful, odd shaped furniture, parents found children's interest in many items wanes as the novelty wears away. Regardless of fancy play furniture children will still play with any type of conventional furniture. This is confirmed by the Child Interviews when children expressed they are primarily interested in play activities and not primarily focused on an items appearance.

Each of the studies support that it is possible for one item to support multiple activities. This brings up an interesting opportunity for designers to consider when creating furniture that pleases parents and children.

Resulting Design Considerations

- A single piece of furniture can have multiple functions, including play.
- Parents would prefer if play furniture did not take up extra space.
- Parents would prefer if play furniture appropriately matched the room's décor.
- Parents are open to children playing with furniture as long as it is durable, because they do not want to replace furniture.
- Both parent and children are concerned with safety. Parents attend to catastrophic safety issues children are not experienced with including structurally sound furniture. Children avoid injuries they have incurred before.
- Children are activity focused not feature focused.

CHAPTER 5

A TOOL FOR DESIGNERS

Scenarios

While the ultimate intended beneficiary of this study are children, this study seeks to reach that beneficiary through children's furniture designers. In developing a resource tool for these designers, it is necessary to understand designer's needs. To ensure that the tool would be useful, several scenarios were developed (Figure 5.1).

The objective of the scenarios was to explore several design situations, survey different approaches to furniture design for children and, most importantly, understand the various needs of designers in different situations. While clearly not exhaustive, the ten scenarios evaluated did provide a broad perspective. From these, a wide number of needs became apparent, including considering scale or bodyfit, age appropriateness, activity types supported, play types supported and material selection. This study does not seek to address all of those needs (e.g., bodyfit or information for children of various ages). Although the scenario analysis did prove helpful in determining how data could be synthesized further and categorized, this study highlights data that are relevant to designers regarding furniture and play in its most elemental form.

	Design Brief	Screen 1	Screen 2
1	Child's chair that is durable and can be used, stacked and stored by children from 3 to 10 yrs old to be used at elementary schools.	Can a single size chair fit 3 - 10 year olds? Must be made of light, weight durable material. Must not take up space when stored.	Learn **physical size** of different aged children. **Strength** of children. What **form** is easy for the children to move for storage? Handles, folding, stacking?
2	Couch that allows for children to disassemble and reassemble for child's play. Couch must also be attractive, durable, stain resistant and comfortable for adults.	What **materials** are durable, stain resistant, and comfortable? How large should the cushions be and what shape? Form What holds the cushions in place?	**Form** of cushions, easy for children to place, carry. What are the **physical abilities** of children at different ages. How much can be lifted by a child - **strength**? What is comfortable for parents?
3	Desk designed to last several generation and is convertible for use during early childhood to adulthood and the next generation.	What will people want for generations? Materials & style. What **size desk does a child** need throughout the years?	Find **bodyfit info** for different age children and
4	Storage for children with little hand dexterity.	What are different ways items can be **stored**? What are different ways a storage item can be opened or closed? **Form**	Forms for storage - shelf, drawers, chest, drawers, boxes... Forms for opening doors, drawers, chest...
5	Blow moulding company want to break into the childs play furniture category.	What ways do children at **different ages play**? How much of their bodies do they use? **Scale**. What are some basic uses of furniture - **support of body or things and storage**. What is the limit of shapes that can be made by blow moulding?	What are different types of active play? Manufacture objects that are a little flexible, but hold its shape - can not be crushed
6	Oregon furniture company wants to make childrens furniture sets using only local materials and and labor.	What material & labor is available locally? What items make a bedroom set? - Bed, night stand, dresser/wardrobe, shelf, chair, desk.	
7	FEMA needs emergency furniture for families in distress. Must be easy to manufacture, store, ship, assemble and last 2 months continuous use. Must be able to be used in tents to trailers. To be disposed after use - should consider sustainable materials.	Materials must be comfortable, durable and recyclable. Furniture must be stable and safe. Understand different **body types and sizes**.	
8	In order to compete with lower labor cost in foreign countries a US child furniture manufacturing company has purchased new manufacturing machinery. All furniture must be converted to the new machinery.	What are the capabilities & limitations of the machinery? What materials can be used? What other ways can cost be cut?	What are the basic requirements for children's furniture? What are the pieces we want make?
9	Furniture company wants to create a new line of children's furniture that allows for more social interaction	How do kids play together?	Look up **social play** for kids at **different ages**
10	Modular units designed to allow children to build their own furniture and play structures.	How kids like to play? What is the age range they want to design for? What modular unit (shape) is easy to build with?	Play and Shape - must allow for several furniture alternatives. Play is determined by chil, not designed by the the creater of the toy. Age - differing physical and cognitive abilities, play interest, style interest.

Figure 5.1 Designer's Scenarios (Topping, 2008)

Features

A basic informative tool should present play activities, play types and furniture features. Designers can review this data to better understand how furniture facilitates play and what type of play is occurring.

Several approaches to arranging the catalogue of features were considered. Some of these were deemed to have little use or could detrimentally narrow the creative purview of a designer. For example, the catalogue could be sorted by play type. However, the scenario exercise did not suggest designers would often be looking to reinforce a specific type of play (e.g., seeking to facilitate "Mastery" play is unlikely, but seeking to facilitate play in general is quite likely). Thus, sorting by play type was not chosen as its use would be limited.

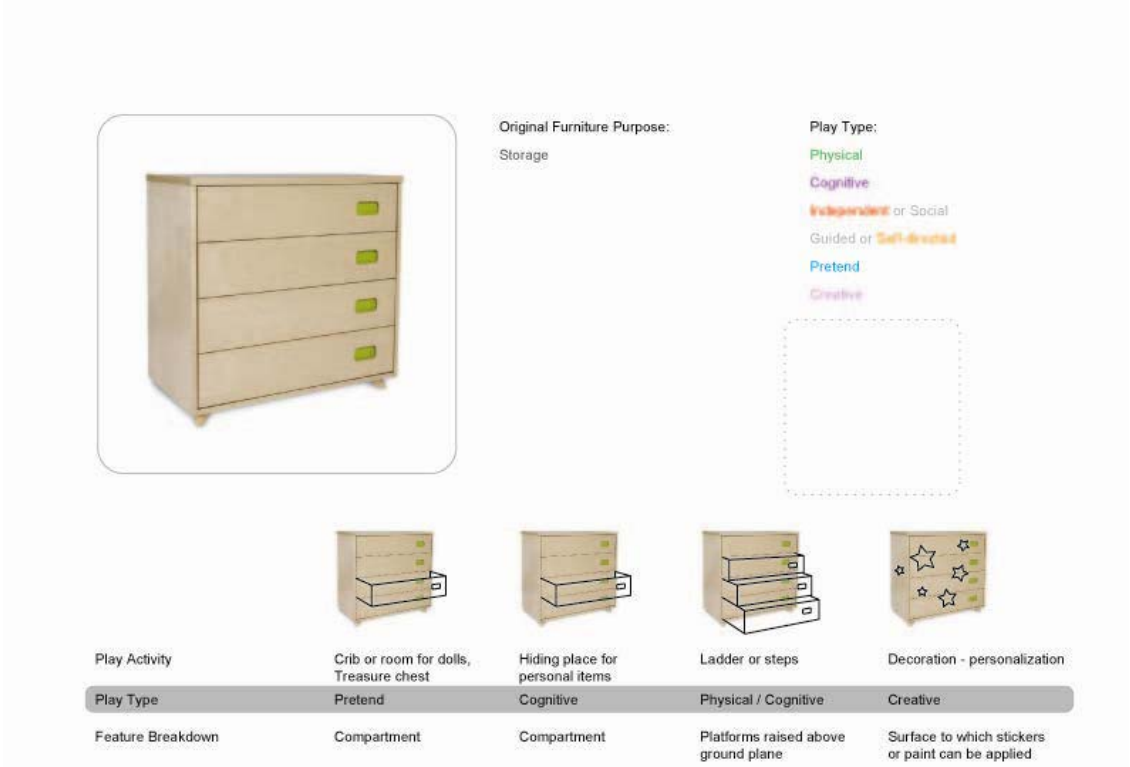

Figure 5.2 Furniture Insights (Topping, 2008)

Another approach considered was sorting by furniture piece (Figure 5.2). But by specifying a specific furniture piece, the catalogue would narrow the designer's perspective, why could a feature that appeared to this investigator to be appropriate for a dresser not be incorporated by a designer with a broader perspective into chairs or into desks? Cataloguing by furniture piece would require not listing the feature for certain furniture pieces (otherwise the entire feature list is repeated for all furniture pieces). This exclusion of features for some furniture pieces unduly limits the potential for lateral thinking in design. For example, if attachable or "roll down" fabric walls were identified as a feature in bunk beds which facilitate innovative play (e.g., fantasy fort), a desk designer may not have seen this feature which could be conceivably used to turn a desk into a fantasy fort.

Instead, the catalogue was driven by features. Based on the findings of the scenarios, the catalogue was organized in two columns. The first column lists each feature, often with an illustrative example. The second column includes the types of play activities which the feature could facilitate. For each play activity the primary types of play (physical, cognitive, independent or social, guided or self-directed, pretend and creative) were also provided to illustrate the quality of play. This approach was deemed to be easy to skim, yet would not unduly limit designer creativity (Table 5.1).

Information in Table 5.1 is represented in a simple static format. A more dynamic format could be proposed that would allow the designer to input desired search terms to filter or sort the data, which could provide the designer with quick access to more specific information. The concern is how data can be presented with out limiting the designers thought process of making unique and potentially beneficial designs of furniture that can support play.

Table 5.1 Furniture Insights (Topping, 2008)

Feature	Sample play activities (Play type)
Areas defined by walls (e.g., area under a bed with roll-down fabric walls)	• Hangout for friends (Social) • Hideout – private place for quiet play (Cognitive, Creative) • Pretend store, house, fort ship (Pretend, Social) – Can be enhanced with general features (windows, zipper doors) – Can be enhanced with suggestive features (e.g., "General Store" sign)
Shelves, platforms or other surfaces upon which toys or dolls can be arranged	• Doll world (Pretend, Creative) – Can be enhanced by elevating shelf to ergonomic height (e.g., child waist or chest level)
Elevated platform, sturdy and stable enough to support a child's weight (e.g., top of toy box)	• Stage (Physical, Pretend) – Can be enhanced with step(s) • Climbing, dropping and jumping (Physical) – Can be enhanced with step(s) – Can be enhanced with cushioned landing surface (dropping / jumping)
"Step-able" features: platforms raised above ground plane at sequentially higher elevations • Ladders • Steps or step-like attributes (e.g., dresser drawers)	• Climbing with change in elevation vs. horizontal climbing as in "monkey bars" (Physical, Cognitive) • Dropping and jumping (Physical) – Can be enhanced with widen space for dropping – Can be enhanced with adequate vertical space – Can be enhanced with cushioned landing surface (dropping / jumping)
Compartments (e.g., drawers)	• Crib or living space for dolls (Pretend) • Treasure chest (Pretend) • Hiding place for personal items (Cognitive)
Surface to which stickers or paint can be applied	• Decoration, personalization (Creative) – Can be enhanced with materials or coatings resistant to damage or which facilitate removal (parental reservations) – Can be facilitated by providing decorative materials (stickers, paints, crayons, etc.)

CHAPTER 6

CONCLUSION

The delineation of furniture and toys is largely an adult construct. Children learn from adults the primary use of furniture, but they are not restricted to that single use. Studies conducted for this research show furniture will be used for play as easily as toys. In some ways, children are acculturated to view furniture as separate from toys. Certain play activities, which likely have a strong development benefits, are discouraged by parents (e.g., physical development and jumping on the bed). The concerns of parents (durability and safety of furniture when used in play) could be addressed in the design of children's furniture.

Considerations

From this research, several potential features of furniture which could facilitate play were identified and catalogued. Many of these features are currently included in playgrounds, toys and current furniture designs. The purpose of this study was to provide guidance to designers who seek to enhance the play-ability of their designs for children furniture. Given the time children spend with furniture and the developmental advantages of play established in literature, designs which encourage, rather than discourage, play with furniture present a significant and over look design opportunity.

Discussion

As anticipated, this study found that children do in fact choose things to play with which they find in their environment, without regard to their original intended purpose. As most people and children are surrounded by furniture, it is no surprise that children's play often involves furniture.

Several features were identified which could be useful to designers who seek ideas on how to incorporate play-facilitating attributes in their design. This study has demonstrated that children often perceive the uses of furniture in ways that differ from adults and the designers who created them. Given these differences in perceptions, the feature catalogue can help close that perceptual gap and hopefully allow designers to think beyond their conventional constructs when designing for this end user.

This study raised several interesting points which merit further investigation. Given the interview sample size, it was not possible to understand how play differs by age group. What features are more suited to facilitate play according to age groups? Likewise, anecdotal observations suggest that some elements of play may differ by gender or culture. Broadly speaking, designs that more closely match the end-user's needs are more likely to deliver the most value to that end user. How can the variables of gender or culture be considered to further customize and enhance the design of children's furniture? Further study to answer these questions could strengthen the feature catalogue.

APPENDIX A

STUDY 1: FURNITURE TYPOLOGY – IMAGE SURVEY AND SORTING


Furniture Typology Library:
Adjust
Adjust
Eat
Embellish
Move
Move
Play
Play
Play
Recline
Recline


Secure
Sit
Sit
Sit
Store
Store
Store
Work
Work
Work

APPENDIX B

STUDY 2: FURNITURE LANGUAGE – EXPLORING PARENT AND DESIGNER PERCEPTIONS

GEORGIA INSTITUTE OF TECHNOLOGY

Thesis Research Proposal

Marisa Topping
Kevin Shankwiler, advisor (PI)

Furniture Language Research Proposal 4/6/08 v1

Problem Statement:
The purpose of this research study is:

- To gain an understanding of the ways furniture communicates its use to children (ages 4-8) and adults.
- To learn how adults categorize furniture used by children, and discover what similarities or differences exist between the pieces of furniture in each category.
- To understand if designers, child experts (child psychologist or teachers) and parents categorize the furniture images similarly or differently.

Method:

1. Action Research – Part One: Image Organization – Collage

Sessions with designers, child experts and parents are conducted, during which images of toys and furniture will be organized on a continuum.

1. Objectives – to identify:
    a. Categories of Furniture by:
        i. Use
        ii. Appearance
    b. Similarities of furniture in each category.

2. Subjects:
    a. 30 Designers, Child Experts, Parents.

3. Supplies:
    a. Images of toys and furniture.
    b. Glue
    c. Paper

4. Procedure:
    a. Meet subjects
    b. Introduce study and explain consent information.

c. Begin collage – Instruct participants to:
    i. Organize images into two piles – one for furniture and another for toys.
    ii. Identify if there is a third pile – items that are not only toy or furniture or are both.
    iii. Organize images along a continuum. The continuum is runs from “Toy” to “Furniture”. Images placement on the continuum represents whether its qualities are more like “Toys” or “Furniture”

2. Interview – Part Two: Discussion

Participant discuss placement of the images.

1. Objectives:
    a. Understand the organization behind the arrangement of images on the continuum.
    b. Learn what characteristics of the image directed that arrangement.

2. Procedure:
    a. The participants will be asked to explain:
        i. Why images are placed at the toy or furniture endpoints?
        ii. Why images are not placed at the toy or furniture endpoints?
        iii. What about the images in the center are different from the images located at the endpoints?
        iv. How might the items (the image represents) in the center be used differently than items located at the endpoints?
        v. What would you call this center category?

Toy – Furniture Continuum (Script)

Instructions:

1. **Separate images into 2 piles**. One for **toys** and the other for **furniture**.
2. Is there **3rd pile** that could be made of items that do not quite fit in the toy or furniture piles? Please make another pile with these items.
3. **Place images given along the Toy – Furniture Continuum.** Arrange or organize the images along the continuum.
4. Describe **why images are placed** around the toy end/ furniture end. Discuss characteristics.
5. Describe **why images are not placed** at the other end of the continuum. Discuss characteristics.
6. In the center, what makes these **objects look different**?
7. In the center, how are these **objects used differently**?
8. What would this center category be called?
9. Please share any other comments about the items or continuum.

Georgia Institute of Technology

Project Title: **Interview and Observation: Furniture Use by Children**
Investigators: **Kevin Shankwiler (PI)**
Marisa Topping
Consent Title: **Consent Interview-Observation 1/22/08 v3**

Research Permission Form for Parents of Minor Subjects

You are being asked to allow your child to be in a research study. You are encouraged to take your time in making your decision. Feel free to ask any questions, at any point in the study, about anything you do not understand. Discuss this study with your friends and family.

Purpose:
The purpose of this study is:

- To learn how children (ages 4-8), relate to and use furniture.
- To understand the qualities of the furniture the parent and child likes and dislikes.
- To observe how the child has changed the furniture and to understand why they changed the furniture – for fun/play, so that it is easier to use.
- To document, in photos, the changes the child has made to the furniture.
- Approximately 30 children will participate in this study.

Procedures:
If you decide to allow your child to be in this study, his/her part will involve:

- Showing the investigator what pieces of furniture they (the child) use the most in their house.
- Explaining to the investigator how they use the furniture and why they use it that way.
- Pointing out to the investigator what changes they made (or continue to make) to the furniture and describe why.
- Describing the furniture they think would be better for them and what it should do.
- Photos of the child's furniture may be taken to document how the child has changed or arranged the furniture.
- Photos of the child showing how the furniture is to be used may be taken if the parent and child give consent.
- Audio recording of the child's description of the furniture will be recorded with the parent's consent.

Risks/Discomforts

The following risks/discomforts may occur as a result of your child's participation in this study:

- This study poses minimal risk to your child.
- You may assist your child during the study to help them feel more comfortable.

Benefits

The following benefits to your child are possible as a result of being in this study:

- There are no direct benefits to you or your child as a result of being in this study. But we hope that you and your child's involvement in this research will help us generate information that may help design safer and more useable children's furniture.

Compensation to You/Your Child

- Your child will receive a toy for participating in the research even if you or your child decides at any point not to continue.
- Should any patents or commercial products result from this research, participants will not receive royalties or other payments.

Confidentiality

The following procedures will be followed to keep your child's personal information confidential in this study:

The data that is collected about your child will be kept private to the extent allowed by law. To protect your child's privacy, your child's records will kept under a code number rather than by name. Your child's records will be kept in locked files and only study staff will be allowed to look at them. Your child's name and any other fact that might point to your child will not appear when results of this study are presented or published.

- We will not share demographic information with anyone outside of the research team unless your child's identity has been concealed or made anonymous at which time it may be used for educational purposes.
- To further protect privacy of you and your child, the raw data will be handled and analyzed exclusively by authorized personnel. Authorized personnel are: the Principal Investigator, Kevin Shankwiler, and the study staff working on this project. The individuals working on this project will be instructed about the importance of confidentiality and how to maintain it. All research and background materials will be in the custody of Investigator, Marisa Topping.

- Audio recordings and photos collected during this study will be kept in locked files. Only the study staff will have access to them. The tapes will be used for the purpose of collecting data for the study, as described in this document only.
- Once the study has ended, the recordings will be stored for archival purposes.

To make sure that this research is being carried out in the proper way, the Georgia Institute of Technology IRB will review study records. The Office of Human Research Protections may look at study records.

Costs to You

- There is absolutely no cost to you.

In Case of Injury/Harm

- If your child is injured as a result of being in this study, please contact Kevin Shankwiler at telephone (404) 894-4874. Neither the Principal Investigator nor Georgia Institute of Technology have made provision for payment of costs associated with any injury resulting form participation in this study.

Subject Rights

- Your child's participation in this study is voluntary. You do not have to allow your child to be in this study if you don't want him/her to be involved (or 'to participate').
- You have the right to change your mind and remove your child from the study at any time without giving any reason, and without penalty.
- Any new information that may make you change your mind about allowing your child to participate in this study will be given to you.
- You will be given a copy of this permission form to keep.
- You do not waive any of your or your child's legal rights by signing this permission form.

Questions about the Study or Your Child's Rights as a Research Subject

- If you have any questions about the study, you may contact Kevin Shankwiler at telephone (404) 894-4874.
- If you have any questions about your child's rights as a research subject, you may contact Ms. Melanie Clark, Georgia Institute of Technology IRB at (404) 894-6942.

If you sign below, it means that you have read (or have had read to you) the information given in this permission form, and you would like your child to participate in this study.

_____

Subject Name

Parental Signature	Date
Signature of Person Obtaining Permission	Date

(Please distribute widely to the Atlanta Metro Area)

Participants Needed for Research Study at Georgia Tech

Georgia Tech Industrial Design Graduate Student is **looking for Designers, Parents of children (3+ years old), Teachers of children and Child Psychologists** to participate in a **research study** about furniture for children. This study will help researchers learn more about **how furniture communicates its main purpose**. The goal of this study is to collect information that can be used to design furniture for children that supports different type of play which aid in continuing physical, emotional and social development.

- We are recruiting up to 30 individuals to participate in this research study. You will be asked to create a collage from images provided to and then discuss your collage with the interviewer. The research session will last approximately **30 minutes** in a location convenient to you.

If you are interested or would like more information about the study, please contact Marisa Topping at (267) 250-0712 or by email, marisa_topping@hotmail.com.

Toy to Furniture
Rampling Fish
Rampling pig
Rampling Giraffe
toy

Toy to Furniture
toy
toy
Romping Fish
Romping Pig
Romping Giraffe

Toy to Furniture
furniture
toy
Romping Fish
Romping pig
Romping Giraffe

Toy tc
Rompling Fish
Rompling pig
Rompling Giraffe

Toy to Furniture
FURNITUR MAKING FURNITUR

furniture
niture
Rompling Fish
Rompling pig
Rompling Giraffe
TOYS W/ RAW FEATURE
FURNITURE TOYS
RAW W/ FURNITURE

Toy to Furniture
furniture
Romping Fish
Romping pig
Romping Giraffe

Toy to Furniture

furniture
crayons
toys
Ramping Fish
Ramping pig
Ramping Giraffe


Toy to Furniture
Romping Fish
Romping pig
Romping Giraffe


Toy to Furniture
toy
furniture
Romping Fish
Romping pig
Romping Giraffe


Romping Fish
Romping Pig
Romping Giraffe
Ribbetti
Boy


furniture
Romping Fish
Romping Giraffe
Romping pig
Kids play with(hands)
Kids sit/stand on
Soft furnitures
Hard furnitures


Romping Fish
Romping Pig
Romping Giraffe

Toy to Furniture
toy
furniture
Romping Fish
Romping pig

APPENDIX C

STUDY 3: TRACE OBSERVATION AND IN-HOME INTERVIEWS

GEORGIA INSTITUTE OF TECHNOLOGY

Thesis Research Proposal

Marisa Topping
Kevin Shankwiler, advisor (PI)

User Behavior Research Proposal, v3

Problem Statement:
The purpose of this research study is:

- To gain an understanding of how children (ages 4-8) relate to and interact with furniture in their home.
- To learn how children change or modify their furniture and why.
- To understand parents' expectation of their child's furniture and how those expectations may influence how the child interacts with the furniture. Parents' expectations include the furniture's cost, performance, appearance and how they feel the child should use the furniture.

Method:

1. Interview

Interviews with parents are conducted where their child's furniture and furniture use are discussed.

5. Objectives – to identify:
    a. Furniture use expectations of:
        i. Parents
        ii. Child
    b. Reasons parents choose different types of furniture

6. Subjects:
    a. Parents of children (ages 4-8)

7. Procedure:
    a. Meet at subjects home
    b. Introduce study and consent information
    c. Interview – Discuss:
        i. Furniture choices bought for children
        ii. Furniture use by children
        iii. Furniture expectations by parent

2. Participatory Observation

Parent gives a tour of the furniture their child uses. Photos of the furniture the child uses will be taken. Audio recording of the parent's comments may be taken.

1. Objectives:
    a. Identify if children modify their furniture in any way. If so:
        1. Understand furniture modification made by child
        2. Learn why the child modified the furniture

2. Subjects:
    a. 20 Parents of children (ages 4-8)

3. Supplies:
    a. Camera (Digital photo)
    b. Audio recording device

4. Procedure:
    a. The parent will be asked to show the investigator furniture in their bedroom.
    b. As the parent shows the furniture the investigator will make inquiries of the furniture and ask questions of the parent such as:
        1. What their children do with the furniture?
        2. Why does the child do these things with the furniture ?
        3. How does the child change the furniture?
        4. Why did the child change it?
        5. What do you think the child would like to with the furniture?
        6. How might the child like to play with the furniture?
        7. What are the rules must the child follow when using their furniture or customizing their furniture?
    c. Photos of the child's furniture will be taken
    d. Observation of how the child has modified the furniture will be noted for later analysis.

Georgia Institute of Technology

Project Title: **Interview and Observation: Furniture Use by Children**
Investigators: **Kevin Shankwiler (PI)**
Marisa Topping
Consent Title: **Consent Interview-Observation 1/22/08 v3**

Research Consent Form

You are being asked to be a volunteer in a research study.
You are encouraged to take your time in making your decision. Feel free to ask any questions, at any point in the study, about anything you do not understand. Discuss this study with your friends and family.

Purpose:
The purpose of this study is:

- To learn how children (ages 4-8), relate to and use furniture.
- To understand the qualities of the furniture the parent and child likes and dislikes.
- **To understand how the children's furniture was chosen.**
- **To learn the parent's expectations for the furniture.**
- To observe how the child has changed the furniture and to understand why they changed the furniture – for fun/play, so that it is easier to use.
- To document, in photos, the changes the child has made to the furniture.
- Approximately 30 children will participate in this study.

Procedures:
If you decide to be in this study, your part will involve:

- The study will start by meeting with the investigator to go over the content of the study, your and your child's participation, verifying your consent and filling out a short form with your background information.
- The interview with the investigator will include questions about your child's furniture, how the furniture was chosen, your expectations regarding the furniture, how it should be used and how it actually is used by your child.
- You may decide to take part of your child's part of the study, which includes:
    - Discussing with the investigator what pieces of furniture they (the child) use the most in their house.
    - Explaining to the investigator how they use the furniture and why they use it that way.

- Pointing out to the investigator what changes they made (or continue to make) to the furniture and describe why.
- Describing the furniture they think would be better for them and what it should do.
- Photos of the child's furniture may be taken to document how the child has changed or arranged the furniture.
- Photos of the child showing how the furniture is to be used may be taken if the parent and child give consent.
- Audio recording of the child's description of the furniture will be recorded with the parent's consent.

Risks/Discomforts

The following risks/discomforts may occur as a result of your child's participation in this study:

- This study poses minimal risk to you.

Benefits

The following benefits to you are possible as a result of being in this study:

- There are no direct benefits to you or your child as a result of being in this study. But we hope that you and your child's involvement in this research will help us generate information that may help design safer and more useable children's furniture.

Compensation to You/Your Child

- Your child will receive a toy for participating in the research even if you or your child decides at any point not to continue.
- Should any patents or commercial products result from this research, participants will not receive royalties or other payments.

Confidentiality

The following procedures will be followed to keep your child's personal information confidential in this study:

The data that is collected about your child will be kept private to the extent allowed by law. To protect your child's privacy, your child's records will kept under a code number rather than by name. Your child's records will be kept in locked files and only study staff will be allowed to look at them. Your child's name and any other fact that might point to your child will not appear when results of this study are presented or published.

- We will not share demographic information with anyone outside of the research team unless your child's identity has been concealed or made anonymous at which time it may be used for educational purposes.

- To further protect privacy of you and your child, the raw data will be handled and analyzed exclusively by authorized personnel. Authorized personnel are: the Principal Investigator, Kevin Shankwiler, and the study staff working on this project. The individuals working on this project will be instructed about the importance of confidentiality and how to maintain it. All research and background materials will be in the custody of Investigator Marisa Topping.
- Audio recordings and photos collected during this study will be kept in locked files. Only the study staff will have access to them. The tapes will be used for the purpose of collecting data for the study, as described in this document only.
- Once the study has ended, the recordings will be stored for archival purposes.

To make sure that this research is being carried out in the proper way, the Georgia Institute of Technology Institute Review Board will review study records. The Office of Human Research Protections may look at study records.

Costs to You

- There is absolutely no cost to you.

In Case of Injury/Harm

- If you are injured as a result of being in this study, please contact Kevin Shankwiler at telephone (404) 894-4874. Neither the Principal Investigator nor the Georgia Institute of Technology have made provision for payment of costs associated with any injury resulting form participation in this study.

Subject Rights

- Your participation in this study is voluntary. You do not have to be in this study if you don't want to be.
- You have the right to change your mind and leave the study at any time without giving any reason, and without penalty.
- Any new information that may make you change your mind about being in this study will be given to you.
- You will be given a copy of this consent form to keep.
- You do not waive any of your legal rights by signing this consent form.

Questions about the Study or Your Rights as a Research Subject

- If you have any questions about the study, you may contact Kevin Shankwiler at telephone (404) 894-4874.
- If you have any questions about your rights as a research subject, you may contact Ms. Melanie Clark, Georgia Institute of Technology at (404) 894-6942.

If you sign below, it means that you have read (or have had read to you) the information given in this consent form, and you would like to be a volunteer in this study.

_____

Subject Name

Subject Signature Date

Signature of Person Obtaining Consent Date

(Please distribute widely to the Atlanta Metro Area)

Participants Needed for Research Study at Georgia Tech

Georgia Tech Industrial Design Graduate Student is **looking for parents of children (4 to 8 year old)** to participate in a **research study** about children and their furniture. This study will help researchers learn more about **how children interact with and manipulate furniture**. The goal of this study is to collect information that can be used to design furniture for children which supports their continuing physical, emotional and social development.

We are recruiting up to 20 individuals to participate in this research study. You will discuss your child's furniture and show your child's furniture to the researcher. **The research session will last approximately 45 minutes in your home and consist of two parts:**

- The **first part** includes **a discussion with the parent** about your child's play activities indoors and how they interact with their furniture. You will also be able to discuss your thoughts of your child's furniture.
- The **second part** of the study includes **a tour of the furniture used by the child**, when you can describe the space that includes the furniture and how they play with the furniture. The tour will be recorded with audiotape and digital photos.

APPENDIX D

STUDY 1: DESIGNER'S SCENARIOS

Design Brief		Screen 1	Screen 2
1	Child's chair that is durable and can be used, stacked and stored by children from 3 to 10 yrs old to be used at elementary schools.	Can a single size chair fit 3 - 10 year olds? Must be made of light, weight durable material. Must not take up space when stored.	Learn **physical size** of different aged children. **Strength** of children. What **form** is easy for the children to move for storage? Handles, folding, stacking?
2	Couch that allows for children to disassemble and reassemble for child's play. Couch must also be attractive, durable, stain resistant and comfortable for adults.	What **materials** are durable, stain resistant, and comfortable? How large should the cushions be and what shape? Form What holds the cushions in place?	**Form** of cushions, easy for children to place, carry. What are the **physical abilities** of children at different ages. How much can be lifted by a child - **strength**? What is comfortable for parents?
3	Desk designed to last several generation and is convertible for use during early childhood to adulthood and the next generation.	What will people want for generations? Materials & style. What **size desk does a child** need throughout the years?	Find **bodyfit info** for different age children and
4	Storage for children with little hand dexterity.	What are different ways items can be **stored**? What are different ways a storage item can be opened or closed? **Form**	Forms for storage - shelf, drawers, chest, drawers, boxes... Forms for opening doors, drawers, chest...
5	Blow moulding company want to break into the childs play furniture category.	What ways do children at **different ages play**? How much of their bodies do they use? **Scale**. What are some basic uses of furniture - **support of body or things and storage**. What is the limit of shapes that can be made by blow moulding?	What are different types of active play? Manufacture objects that are a little flexible, but hold its shape - can not be crushed
6	Oregon furniture company wants to make childrens furniture sets using only local materials and and labor.	What material & labor is available locally? What items make a bedroom set? - Bed, night stand, dresser/wardrobe, shelf, chair, desk.	
7	FEMA needs emergency furniture for families in distress. Must be easy to manufacture, store, ship, assemble and last 2 months continuous use. Must be able to be used in tents to trailers. To be disposed after use - should consider sustainable materials.	Materials must be comfortable, durable and recyclable. Furniture must be stable and safe. Understand different **body types and sizes**.	
8	In order to compete with lower labor cost in foreign countries a US child furniture manufacturing company has purchased new manufacturing machinery. All furniture must be converted to the new machinery.	What are the capabilities & limitations of the machinery? What materials can be used? What other ways can cost be cut?	What are the basic requirements for children's furniture? What are the pieces we want make?
9	Furniture company wants to create a new line of children's furniture that allows for more social interaction	How do kids play together?	Look up **social play** for kids at **different ages**
10	Modular units designed to allow children to build their own furniture and play structures.	How kids like to play? What is the age range they want to design for? What modular unit (shape) is easy to build with?	Play and Shape - must allow for several furniture alternatives. Play is determined by chil, not designed by the the creater of the toy. Age - differing physical and cognitive abilities, play interest, style interest.

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